Remarks

Claims 1-23 are presently pending. Claims 1-5, 11-15, 18-21 stand rejected. Claims 6-10, 16, 17, 22 and 23 are objected to. By this paper independent claims 1, 11, and 18 are amended.

Claims 1, 2, 11, and 12 are rejected under 35 U.S.C. § 102(b) as being anticipated by United States Patent No. 6,522,747 to Reilly et al. ("Reilly"). Reilly discloses design of filter banks to be used in subband processing. Reilly's disclosure may be applied to a wide variety of signal processing settings with echo cancellation given as an example. Claim 1 recites that the echo canceler is adaptable during a double-talk event and that the adaptation module is to update the adaptable filter during a double-talk event.

The present application discloses the need to "provide an improved echo canceler system that modifies the adaptive filter parameters during double-talk and eliminates the need for half-duplex operation." Page 5, paragraph [0014]. The present application describes the inability of the art to provide adaptation during double talk.

> Typical echo cancelers can operate effectively only during far-end talk. When double-talk occurs, the microphone signal consists of a sum of a near-end signal and echoes of the far-end signal. The presence of the near-end signal in the microphone signal hinders proper echo synthesis. The effect produces audible echoes in the signal sent back to the far-end. To prevent the feedback of echoes, the echo-canceler suspends modification of the adaptive filter.

Pages 3-4, paragraph [0009]. The present invention provides adaptation during double-talk to address changes in echo paths.

Reilly does not teach adaptation during a double-talk event. Indeed, Reilly specifically discloses that it is incapable of adapting during double-talk. "The adaptive filter

tries to force e[n] to zero, so the filter is only active (i.e., adapting) when there is no local speech." Column 4, lines 39-44. When there is no local speech, a double-talk event does not exist. Reilly further states that:

> Double-talk refers to the situation where both parties are speaking at the same time. To avoid divergence of the adaptive filters, the coefficients must be frozen during periods of double-talk. Double-talk is usually more noticeable in some subbands than in others. Because of this, a subbanded double-talk detector 26 is used within each subband. If it finds double-talk, even in just one subband, all the adaptive filters are frozen.

Column 6, lines 39-45. Thus, Reilly teaches against adaptation during double-talk which is a conventional teaching. This is in complete contrast to the present invention.

Claim 1 also recites that the adaptation module is to receive a microphone signal and separate a near-end signal from the microphone signal using a blind source separation algorithm. Reilly has no teaching of using a blind source separation algorithm to separate a near-end signal from a microphone signal. Reilly states that subband processing via filter banks could help generate improved solutions for blind deconvolution, echo cancellation, blind signal separation, and double-talk detection. Column 1, lines 16-20. The general application of subband processing to improve signal processing is well known. However, Reilly has no teaching of using a blind source separation algorithm to separate a near-end signal from a microphone signal to achieve echo cancellation.

In order to anticipate, "every element of the claimed invention must be identically shown in a single reference." In re Bond, 910 F.2d 831, 15 USPQ 2d 1566 (Fed. Cir. 1990). The limitations of claim 1 are not found in the cited prior art references, and the Applicant respectfully submits that independent claim 1 represent patentable subject matter. Claim 11 recites updating an adaptable filter based on the echoes during a double-talk event and

applying a blind source separation algorithm to the microphone signal to separate the near-end signal. Accordingly, claim 11 is patentable for the reasons stated above. Claims 2 and 12 include the limitations of claims 1 and 11 respectfully and likewise contain patentable subject matter.

Claims 3, 4, 8, 13, 14, and 18-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Reilly in view of United States Patent No. 6,151,397 to Jackson, Jr. II et al. ("Jackson"). Independent claim 18 recites language similar to that found in claims 1 and 11 and is patentable over Reilly for the reasons discussed above. Claims 3, 4, 8, 13, and 14 depend from claims 1 and 11 and are likewise patentable over Reilly for the reasons discussed above.

Depending claims 3, 4, 8, 13, 14, and 19-20 further include recitations of a preprocessing module to whiten the far-end signal. Jackson is cited in the Office Action for its teaching of a preprocessing module to whiten a far-end signal. Jackson teaches multiple microphones and blind source separation to separate the signal of interest, on the near-end, from noises which are also on the near-end. Jackson is near-end focused and uses multiple speakers to create an interference pattern at some location in the near-end.

Jackson mentions whitening as follows:

> In addition to separation, it has the side-effect of whitening the outputs. The whitening effect is avoided by using blind source separation system 740 of FIG. 8.

Column 11, lines 12-14. Jackson refers to the temporal whitening effect that blind deconvolution algorithms tend to produce in the signals that they output. In Jackson, whitening is an undesired artifact of the signal processing algorithm, and Jackson proposes a

work around that eliminates the whitening effect. Column 11, lines 34-35. Jackson uses the term "whitening" with a different connotation than the present application. For Jackson, "whitening" refers to a characteristically flat spectrum, and Jackson's algorithms, and many others, have a tendency to produce this characteristic.

In the present invention, the term "whitening" has to do with a well defined characteristic that is specifically imposed on the far-end signal. In the present invention, a whitened signal is one that satisfies a specific mathematical property in terms of its exponentially averaged autocorrelation function. The present invention performs preprocessing specifically to create whiteness. Jackson wants the output signals to retain their original spectral shape. Therefore, any processing Jackson performs is not to change the spectrum and not to whiten the signal. Rather, Jackson wants to leave its original spectral content in tact.

Jackson does not teach the whitening of a far-end signal and decorrelation of a microphone signal. Jackson is near-end centric, seeks to avoid whitening, and therefore teaches away from the whitening of a far-end signal. "To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." MPEP § 2143.03. Reilly teaches away from adaptation during a double-talk event. Jackson teaches the avoidance of whitening. The cited references do not teach or suggest the claim limitations.

Claims 5, 15, 21 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Reilly in view of Jackson and further in view of well known prior art. Claims 5, 15, and 21

include the limitations of the claims from which they depend and are patentable over Reilly and Jackson for the reasons discussed above.

In view of the foregoing, all pending claims represent patentable subject matter. If there are any remaining issues of the pending claims that may be clarified by telephone, the Examiner is requested to call the undersigned. A Notice of Allowance is respectfully requested.

Respectfully submitted,

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